

REMARKS

Claims 4-6 are currently pending in this application. By this amendment, claims 4-6 are amended, and claim 1 is canceled without prejudice. Support for the amendments is found in the specification, including the claims, as originally filed. No new matter has been introduced. Favorable reconsideration of the application in light of the foregoing amendments and following comments is respectfully solicited.

I. Telephone Interview of September 3, 2009

Applicants thank Examiners Rademaker and Michener for conducting a telephone interview with the undersigned on September 3, 2009. The interview related to, in part, the “patentable weight” of limitations recited using functional language. Agreement was not reached on this point; accordingly, Applicants have addressed this issue in more detail below. Additionally, Applicants requested an indication as to what the Examiner considered to be a basis for obviousness for each of the relations “ $0 < \Delta P_o \times \Delta P_p$ ” and “ $|\Delta P_p| \leq |\Delta P_o|$.” In addition to the references cited in the Office Action (*i.e.*, Saito, Imamura, and Simpson), the Examiner noted Meltser, which has been cited in earlier Office Actions.

In the interview summary mailed on September 9, 2009, it is indicated that the “Examiner discussed the terminology ‘a controller programmed to variably control . . .’ as compared to ‘a controller which variably controls.’ ” It is respectfully noted that the context of that discussion was in explaining that although the phrase ‘programmed to’ is often used in claims to convey a structural difference which is the result of programming (*see, e.g., In re Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969)), such language is *not necessary* to express structural differences reflected by functional language in an apparatus claim, as Applicants explain in more detail below.

II. The Office Action Improperly Interprets Claimed Limitations as Lacking “Patentable Weight”

Independent claims 5 and 6 each include, *inter alia*,

a controller configured to:

variably control the flow rate of the inert gas supplied to said fuel cell based on the values of P_a and P_c during a purge operation of replacing the fuel gas and/or oxidant gas in said fuel cell with the inert gas supplied from said inert gas supply means when said fuel cell is started up or shut down, such that the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied and the relation $|\Delta P_p| \leq |\Delta P_o|$ is satisfied, where a differential pressure ΔP is defined as $\Delta P = P_a - P_c$, ΔP_o is the differential pressure during operation, and ΔP_p is the differential pressure during the purge operation.

Additional limitations relating to the recited controller element are recited in the last two paragraphs of each of claims 5 and 6.

The Examiner incorrectly construes the claims, thereby improperly ignoring the limiting effect of express positive limitations recited in the claims. For example, with respect to the recitation in claim 1 as previously presented “that the relation $0 < \Delta P_o \times \Delta P_p$ and $|\Delta P_p| \leq |\Delta P_o|$ is always satisfied,” the Examiner asserts “that with regard to the purge operation and the normal operation of the fuel cell system, the limitations have been considered with regard to structure, but the operation (method) is not given patentable weight.” Office Action, page 4, lines 15-17; page 5, lines 11-13; page 9, lines 3-13. Similarly, with respect to claims 5 and 6 as previously recited, the Examiner improperly ignores the limiting effect of claimed limitations, by asserting that the claims “contain[] functional language which does not impact the structure of the fuel cell system” Office Action, page 6, lines 3-4; page 6, lines 17-18; page 7, lines 7-8). Based upon this erroneous construction, the Examiner is applying an unreasonably broad interpretation of the claims, thereby improperly rejecting the claimed subject matter in view of art which does not demonstrate obviousness of the claims as properly interpreted and considered as a whole.

A. The law does not recognize the Examiner's treatment of functional language in apparatus claims

It is a basic tenet of claim interpretation that a claim be considered “as a whole”¹, and that legal findings of assertion or obviousness must be made with respect to each and every limitation of the claim. By using a flawed interpretation which improperly ignores the limiting effect of language recited in the claims, the Examiner fails to address all of the claim limitations, and thus has not demonstrated a prima facie case of obviousness of the claimed subject matter. The Examiner improperly ignores a positive limitation upon the claimed subject matter: that the recited “controller [is] configured . . . such that the relation $0 < \Delta Po \times \Delta Pp$ is always satisfied and the relation $|\Delta Pp| \leq |\Delta Po|$ is satisfied.” Likewise, positive limitations recited in the last two paragraphs of each of claims 5 and 6 are also improperly ignored.

The Examiner misunderstands or misapplies the law – functional limitations are limiting on the structure of apparatus claims. A number of cases, some of which are also discussed in the MPEP, are discussed below. It is respectfully noted that in each case, even where functional language is used to recite a claimed apparatus, such functional limitations were limiting upon the scope of the claim. The real question for determining anticipation or obviousness was whether the cited art anticipated or renders obvious such limitations.

1. Swinehart

In re Swinehart, 439 F.2d 210 (CCPA 1971) explains:

We take the characterization “functional”, as used by the Patent Office and argued by the parties, to indicate nothing more than the fact that an attempt is being made to define something (in this case, a composition) by what it does rather than by what it is (as evidenced by specific structure or material, for example). In our view, there is nothing intrinsically wrong with the use of such a technique in drafting patent claims. Indeed we have even recognized in the past the practical necessity for the use of functional language. See, for

¹ See, e.g., 35 U.S.C. § 103(a) (relating to whether “the subject matter as a whole would have been obvious”) (*emphasis added*)

example, *In re Halleck*, 421 F.2d 911, 57 C.C.P.A. 954 (1970). We recognize that prior cases have hinted at a possible distinction in this area depending on the criticality of the particular point at which such language might appear. Our study of these cases has satisfied us, however, that any concern over the use of functional language at the so-called "point of novelty" stems largely from the fear that an applicant will attempt to distinguish over a reference disclosure by emphasizing a property or function which may not be mentioned by the reference and thereby assert that his claimed subject matter is novel. Such a concern is not only irrelevant, it is misplaced. In the first place, it is elementary that the mere recitation of a newly discovered function or property, inherently possessed by things in the prior art, does not cause a claim drawn to those things to distinguish over the prior art. Additionally, where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.

(emphasis added)

2. *Ludtke*

In re Ludtke, 441 F.2d 660, 169 USPQ 563 (CCPA 1971) is consistent with the approach described in *Swinehart*. In *Ludtke*, the applicant claimed

A parachute canopy comprising

...

a plurality of radially extending the lines interconnecting said panels in a radially spaced relationship said plurality of tie lines providing a radial separation between each of said panels upon deployment creating a region of high porosity between each of said panels such that the critical velocity of each successively larger panel will be less than the critical velocity of the previous panel, whereby said parachute will sequentially open and thus gradually deaccelerate.

(emphasis added)

In its rejection of the above claim, the USPTO asserted that "The statement in these lines of the claims is merely the citation of a desired result, which is not a structural limitation." However, the court did not accept this rationale for rejecting *Ludtke*'s claims. Instead, the court explained:

We agree with the Patent Office that the spatial separation between the panels is recited in functional language; however, as we said recently in *In re*

Swinehart, 58 CCPA 1027, 439 F.2d 210, 169 USPQ 226 (1971), there is nothing intrinsically wrong with the use of such claim language.

... where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.

This is exactly what the examiner did here. It was the examiner's view that the parachute canopy of Menget possessed all the claimed characteristics, including the capability of sequential opening, of appellants' canopy. Therefore, he challenged appellants to show that Menget's canopy did not inherently possess these characteristics.

(emphasis added)

Also, the summary of *In re Ludtke* in MPEP 2111.01(I) states that "The court upheld the rejection finding that applicant had failed to show that Menget did not possess the functional characteristics of the claims." In other words, in *Ludtke* the recited "functional characteristics" were limiting upon the claimed subject matter. However, the court agreed that the USPTO had set forth a case that the Menget reference inherently disclosed the limitations, and that the applicant had failed to rebut the assertion of inherency.

3. *Mills*

In *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990), the applicant claimed an

6. Apparatus for producing an aerated cementitious composition, comprising

...
drive motor means connected through gearbox means providing a pumping capacity of the pump means greater than the feed rate of the ingredients to the mixing chamber provided by the feed means, such that in operation air is drawn into the mixing chamber, and entrained in the mixed ingredients.

(emphasis added)

Similar to the basis of rejection asserted by the Examiner in this application, the USPTO sought to distinguish functional language from the rest of the claim:

The Board affirmed the examiner's Section 103 rejection of claims 6-9 and 11-14, "finding correspondence in the Mathis reference for all of the subject matter recited in the appellants' claims. . . ." With regard to Mills' claim language relating to aerating the mixture, the Board stated: "[i]n our opinion, the differences between claim 6 and the Mathis machine . . . lie solely in the functional language of the claim." The Board further found that Mathis teaches the use of separate input and output motors in order to permit the various mixing means and pumps to operate at different rates, and that Mathis "contemplates a situation wherein the rate of the outlet pump would be greater than the inlet pumps. . . ." The Board concluded on this point: "[w]e are of the opinion that the Mathis machine is capable of being operated in such a fashion as to cause [the output] pump 18 to draw air into the mixing chamber 17 so that it is entrained in the mixture."

(emphasis added)

Or as summarized again later in the decision:

All of the rejected claims are apparatus claims. The Board found "correspondence in the Mathis reference for all of the subject matter recited in appellants' claims" and that "[t]he Mathis machine discloses all of the structure set forth in claim 1" (a method claim not before us). It asserts that the use of such a mechanism would have been obvious and that the differences between claim 6 and the Mathis machine lie solely in the functional language of the claim.

(emphasis added)

In other words, the USPTO compared Mathis against apparatus claim 1 with respect to what it considered to be the "structural" aspect of claim 1, but then was satisfied with asserting that the machine disclosed by Mathis was merely "capable of being operated" according to the functional limitations recited in claim 1. However, the Federal Circuit did not accept this basis of rejection asserted by the USPTO:

After reviewing the record, the arguments in the briefs, and the Mathis reference, we conclude that Mathis would not have rendered the claimed invention obvious. The closest Mathis comes to suggesting Mills' claimed apparatus is at column 3, lines 42-47, which states

[T]he rate at which the inlet 2b receives a solid constituent depends on the speed of the feed screw 4. Such speed can be regulated by a prime mover 6 which includes a variable-speed transmission.

This brief reference contains no suggestion of “pump means and the feed means providing a pumping capacity of the pump means greater than the feed rate of ingredients to the mixing chamber provided by the feed means, such that in operation air is drawn into the mixing chamber, and air entrained in the mixed ingredients,” as provided for in Mills’ claim 6. While Mathis’ apparatus may be capable of being modified to run the way Mills’ apparatus is claimed, there must be a suggestion or motivation in the reference to do so. See *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed.Cir.1984) (“The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification.”). We see no such suggestion. The apparatus claimed by Mills is different from that of Mathis, since the fact that motor 6 of Mathis (the feed means) can be run at a variable speed does not require that motor 20 (connected to the pump) be run at a lesser speed “such that in operation air is drawn into the mixing chamber and air entrained in the mixed ingredients.

(emphasis added)

Thus, disclosure of structural limitations in the prior art, which merely capability of modification, is not enough. It must also be demonstrated that it would have been obvious to actually modify the prior art to yield the claimed functional limitations.

4. *K-2 v. Salomon*

K-2 Corp. v. Salomon S.A., 191 F.3d 1356 (Fed. Cir. 1999) explains proper interpretation of apparatus claims quite directly:

“The functional language is, of course, an additional limitation in the claim. See, e.g., *Wright Med. Tech., Inc. v. Osteonics Corp.*, 122 F.3d 1440, 1443-44, 43 USPQ2d 1837, 1840 (Fed. Cir. 1997) (functional language analyzed as a claim limitation). . . . the functional language tells us something about the structural requirements of the [claimed apparatus]”

(emphasis added)

5. Conclusion

The above cases – in particular *Mills* and *K-2 v. Salomon* – make quite clear that the Examiner’s approach to interpretation, whereby an apparatus claim is divided into functional language and so-called “structure” such that the functional language is treated as an “operation

(method) [which] is not given patentable weight” (*see, e.g.*, Office Action, page 4, lines 16-17) is an incorrect interpretation of the claimed subject matter.

B. The Examiner’s application of cited portions of the MPEP is not consistent with the case upon which those portions of the MPEP rely, or the law for claim construction

The Examiner cites various portions of the MPEP in support of improperly ignoring express positive limitations in the claims. However, they do not support the Examiner’s position.

1. MPEP 2114

Page 7, line 18 to page 8, line2; and page 9, lines 3-13 of the Office Action cite MPEP 2114 as a basis for “not giv[ing] patentable weight” to the claim limitations discussed above.

First, the Examiner asserts

... that it has been held that while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function.

This comment quoted from MPEP 2114, and the case law with the MPEP cites with respect to the statement, does not support ignoring functional language of the claims as lacking “patentable weight.” An additional step is required by the Examiner: a demonstration that the functional limitations are inherent within the cited art. This has not been done. *In re Schreiber*, 128 F.3d 1473 (Fed. Cir. 1997), upon which the cited portion of MPEP 2114 relies, stated:

Schreiber further argues that the functional limitations of his claim distinguish it from Harz. In particular, Schreiber points to the recitation that the claimed top “allows several kernels of popped popcorn to pass through at the same time,” and that the taper of the top is such “as to by itself jam up the popped popcorn before the end of the cone and permit the dispensing of only a few kernels at a shake of a package when the top is mounted on the container.”

A patent applicant is free to recite features of an apparatus either structurally or functionally. *See In re Swinehart*, 58 C.C.P.A. 1027, 439 F.2d 210, 212, 169 USPQ 226, 228 (CCPA 1971) (“[T]here is nothing intrinsically wrong with [defining something by what it does rather than what it is] in drafting patent claims.”). Yet, choosing to define an element functionally, *i.e.*, by what it does,

carries with it a risk. As our predecessor court stated in *Swinehart*, 439 F.2d at 213, 169 USPQ at 228:

where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.

See also In re Hallman, 655 F.2d 212, 215, 210 USPQ 609, 611 (CCPA 1981); *In re Ludtke*, 58 C.C.P.A. 1159, 441 F.2d 660, 663-64, 169 USPQ 563, 565-67 (CCPA 1971).

The examiner and the Board both addressed the question whether the functional limitations of Schreiber's claim gave it patentable weight and concluded that they did not, because those limitations were found to be inherent in the Harz prior art reference. . . . At that point, the burden shifted to Schreiber to show that the prior art structure did not inherently possess the functionally defined limitations of his claimed apparatus.

(emphasis added)

This is consistent with the discussion of *Swinehart* and *Ludtke* above – a demonstration of inherency of the functional limitations must first be shown by the Examiner. Further, as discussed above with respect to *Mills*, it is not enough that the prior art discloses structure which is merely capable of being modified to satisfy the claimed limitations – instead, it must be demonstrated that it would have been obvious to actually modify the cited art in such a manner. However, in this application, the Examiner has not demonstrated a “reason to believe that a functional limitation . . . may, in fact, be an inherent characteristic of the prior art.” Without having made such a demonstration, it is incorrect for the Examiner to assert that limitations of the claims are “not given patentable weight.”

Further, the Examiner asserts that

It has been held that a claim containing a “recitation with respect to a manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all of the structural limitations of the claim.

It is respectfully noted that MPEP 2114, from which the Examiner has quoted, cites *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) as supporting the above proposition. The claims in *Masham*, as noted in MPEP 2114, recited an apparatus “for mixing flowing developer material” and “means for mixing . . . , said mixing means being stationary and completely submerged in the developer material.” MPEP 2114 explains that the Board held that “the amount of submersion [was] immaterial to the structure of the mixer and thus the claim was properly rejected” (*emphasis added*). However, although there are situations in which certain functional language is immaterial as recited in a particular claim, there are also many other situations, such as in this application, where functional language is material to the claimed structure.

In contrast to the *Masham* case, the Examiner has not demonstrated that the functional language recited in the claims is “immaterial to the structure” of the claimed subject matter. To the contrary, as explained by the Federal Circuit in *K-2 v. Salomon*, discussed above, “The functional language is, of course, an additional limitation in the claim,” and “the functional language tells us something about the structural requirements of the [claimed apparatus].” In other words, although the “controller” in the claims is recited, in part, using functional language, there is a physical and structural difference to be found between prior art controllers, which do not satisfy the recited limitations, and a controller which does satisfy the recited limitations. Accordingly, the claims recite structure – a controller with all of its attendant limitations, whether structurally or functionally recited – which is not rendered obvious by the cited art.

Accordingly, MPEP 2114 does not provide a rationale by which the Examiner is allowed to ignore functionally recited positive limitations on the recited “controller.” Thus, the interpretation employed by the Examiner is incorrect.

2. MPEP 2106

The Examiner broadly cites to MPEP 2106 in support of not giving patentable weight to limitations recited in the claims. However, MPEP 2106 does not support the position taken by the Examiner. MPEP 2106, relating to subject matter eligibility under Section 101, explains in MPEP 2106(II)(C) that “USPTO personnel must first determine the scope of a claim by thoroughly analyzing the language of the claim before determining if the claim complies with each statutory requirement for patentability.” It further explains “For products, the claim limitations will define discrete physical structures or materials. Product claims are claims that are directed to either machines, manufactures or compositions of matter.”

Towards considering claim language as not limiting, MPEP 2106(II)(C) further states “[l]anguage that suggests or makes optional but does not require steps to be performed or does not limit a claim to a particular structure does not limit the scope of a claim or claim limitation” (*original emphasis*). However, the claimed limitations identified by the Examiner are positive limitations upon the recited controller – there is no “[l]anguage that suggests or makes optional” the claimed limitations, regardless as to whether they are recited structurally or functionally.

More relevant to the proper interpretation to the claims is the explanation to examiners that “when evaluating the scope of a claim, every limitation in the claim must be considered. USPTO personnel may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered” (*emphasis added*). The Examiner has not done this, but instead has used an unreasonably broad construction of the claims which ignores express positive limitations therein.

3. MPEP 2111.02

The Examiner also broadly cites to MPEP 2111.02 in support of not giving patentable weight to limitations recited in the claims. However, MPEP 2111.02 does not support the position taken by the Examiner.

Based on the title of MPEP 2111.02 – “Effect of Preamble” – alone, it is readily apparent that the section is irrelevant to the positions taken by the Examiner with respect to the language in the body of the claim. MPEP 2111.02 relates to “when a preamble limits the scope of a claim,” and is not informative for making a proper interpretation of the language that the Examiner is improperly ignoring in the claims.

C. Issued patents in the field employing functional language

As an illustration of the limiting effect of the limitations recited with respect to the controller elements included in claims 5 and 6, Applicants respectfully note the use of the language “controller configured to” in conjunction with functional language in issued patents within the fuel cell technologies: U.S. Patent No. 7,251,935, claims 1-9²; U.S. Patent No. 6,969,561, claims 1-3³; U.S. Patent No. 6,861,167, claim 1⁴; and U.S. Patent No. 6,615,940, claims 1-3, 5, 6, and 8-12⁵. The Examiner’s treatment of the present application is inconsistent

² Claim 1 recites, *inter alia*, a “controller configured to move the valve element of the first metering valve to a position between the first and second positions based on the desired velocity signal and to move the valve element of the second metering valve to a position between the first and second positions based on the load signal and a desired pressure in the second chamber.”

³ Claim 1 recites, *inter alia*, a “controller configured to cease delivery of fuel to the fuel cell stack by the fuel delivery system in response to the earlier of either the hydrogen concentration measured by the hydrogen concentration sensor exceeding a hydrogen concentration threshold or the oxygen concentration measured by the oxygen sensor falling below an oxygen concentration threshold.”

⁴ Claim 1 recites, *inter alia*, “a controller configured to temporarily increase the oxidant stream flow rate through the oxidant passage for a resuscitation duration, if the performance of at least one fuel cell in the fuel cell stack falls below a defined threshold value.”

⁵ Claim 1 recites, *inter alia*, a “controller configured to coordinate operations of the electric energy storage device and the fuel cell, so as to adjust output of the fuel cell and input and output of the electric energy storage device; and a traction controller configured to control output of the drive wheels so as to secure tractive force of the vehicle when a predetermined traction control start condition involving wheel slip is satisfied.”

with the proper interpretation of such language, as reflected by the above patents. This reflects on the fact that the Examiner is improperly construing the claims.

D. Conclusion

As explained above, the Examiner's interpretation of the claims is incorrect. The claims include express positive limitations upon the claimed subject matter which have been improperly ignored by the Examiner, resulting in an *unreasonably* broad interpretation of the claims. Although, as discussed above, functional limitations may not be distinguishing over the prior art where such limitations are inherent in the cited art or immaterial to the claimed structure, such is not the case in this application. Thus, Applicants respectfully request consideration of the claimed subject in its entirety, and withdrawal of the rejections based on a correct interpretation of the claims.

III. Rejection Under 35 U.S.C. § 103(a)

In section 2 of the Office Action, claims 1 and 4-6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over JP Patent App. Pub. No. H11-354143 (Saito) in view of U.S. Patent App. Pub. No. 2004/0038098 (Imamura) and U.S. Patent App. Pub. No. 2004/0197614 (Simpson). Applicants respectfully traverse.

As explained above, the last two Office Actions have improperly construed the claims, and incorrectly ignored the limiting effect of express positive limitations upon the claimed subject matter. The discussion below is with respect to the claims as properly interpreted. As the first two Office Actions issued in this application (dated January 2, 2008 and July 3, 2008) appear to have attempted to address, rather than improperly ignore, limitations such as " $0 < \Delta Po \times \Delta Pp$ " and " $|\Delta Pp| \leq |\Delta Po|$," reference is made to the Examiner's earlier arguments addressing

such limitations, including discussion of U.S. Patent App. Pub. No. 2004/0137285 (Meltser), which was also raised by the Examiner in the interview as part of her rationale for obviousness of the limitation " $0 < \Delta P_o \times \Delta P_p$."

Additionally, Applicants respectfully note that the phrase "such that the relation $0 < \Delta P_o \times \Delta P_p$ and $|\Delta P_p| \leq |\Delta P_o|$ is always satisfied," previously presented in claim 1, has been revised to recite "such that the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied and the relation $|\Delta P_p| \leq |\Delta P_o|$ is always satisfied." The remarks previously submitted on pages 4-5 of Applicants' Response filed on October 3, 2008, explaining why the recited relations are nonobvious in view of the cited art, are essentially effective for the revised language as well.

A. The Examiner's "two-prong approach" to rejection

In the Interview Summary dated September 9, 2009, the Examiner indicates "that the last Office Action rejected the claims under a two-prong approach" including "an obvious-type rejection [which] was made by Saito in view of Imamura et al. and Simpson et al." This characterization of the last Office Action appears to be incorrect, as it suggests that examination under the "obvious-type" prong was based on an interpretation of the claims, including all of the limitations recited therein, which was different than that of the other "prong." However, for example, nowhere in the last Office Action is it explained how the cited art (*i.e.*, Saito, Imamura, and Simpson) renders obvious:

- (1) "that the relation $0 < \Delta P_o \times \Delta P_p \dots$ is always satisfied" (claim 1);
- (2) "that the relation $\dots |\Delta P_p| \leq |\Delta P_o|$ is \dots satisfied" (claim 1);
- (3) the last two paragraphs of claim 5; and
- (4) the last two paragraphs of claim 6.

Each of these limitations is improperly ignored as non-limiting upon the claimed subject matter. Instead of a two-pronged analysis, the Examiner instead appears to have performed a two-step analysis, with step 1 asserting an incorrect and unreasonably broad interpretation of the claims, and step 2 rejecting the claims under the incorrect interpretation rendered in step 1. Thus, the basis of rejection under Section 103(a) articulated by the Office Action fails to establish a *prima facie* case of obviousness against the claims as properly interpreted, at least because obviousness of the above limitations was not addressed in the last Office Action.

B. Meltser does not relate to the recited “purge operation”

Claims 5 and 6 each recite, *inter alia*,

a controller configured to . . . variably control the flow rate of the inert gas supplied to said fuel cell based on the values of Pa and Pc during a purge operation of replacing the fuel gas and/or oxidant gas in said fuel cell with the inert gas supplied from said inert gas supply means when said fuel cell is started up or shut down.

In earlier Office Actions, the Examiner has relied upon Meltser in asserting obviousness of the relations “ $0 < \Delta P_o \times \Delta P_p$ ” and “ $|\Delta P_p| \leq |\Delta P_o|$.” Additionally, the Examiner discussed Meltser as a basis for obviousness of these limitations in the interview. However, as explained on page 7 of the Response filed on October 3, 2008, the “purging” described by Meltser does not correspond to the “purging operation” recited in the claims. Meltser, paragraph [0005] explains:

nitrogen can accumulate to an amount that diminishes the performance of the fuel cell stack. This is caused by the nitrogen preventing the hydrogen from getting to the membrane and inhibiting and/or preventing the production of electricity. Thus, the nitrogen can act as a barrier between the hydrogen and the membrane. Therefore, the anode side of the fuel cell stack is purged from time to time in what is known as a “burping” operation. The purging is done by opening the anode side and allowing the anode effluent to flow out of the fuel cell stack while new fuel, under pressure, is supplied to the anode side inlet. The purging of the anode effluent from the fuel cell stack pulls the nitrogen with it and allows the membrane to become substantially free from the nitrogen and be replenished with hydrogen so that efficient electrical energy production can commence again.

(emphasis added)

Meltser's purging/burping operation is performed by supplying "new fuel, under pressure," and does not relate to "replacing the fuel gas and/or oxidant gas in said fuel cell with the inert gas" or disclose that it is performed "when said fuel cell is started up or shut down," as recited in claims 5 and 6. *See also*, Meltser, paragraph [0021] ("During the purging operation, valve 42 is opened while fuel stream 24 is provided to fuel cell stack 22"). In fact, no inert gas supply means is even described in Meltser. Thus, the purging/burping described by Meltser is not helpful in demonstrating obviousness with respect to the "purge operation" recited in this application.

Likewise, and as discussed below, although Simpson describes a purge operation, it does not correspond to a purge operation as recited in the claims.

C. Meltser, alone or in combination with the cited art, does not suggest that "the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied"

The relation $0 < \Delta P_o \times \Delta P_p$ means that the values ΔP_o and ΔP_p are of the same sign (plus or minus). In other words, in a fuel cell system according to the claims, regardless as to whether the fuel cell system is operating or performing a purge operation, either (a) $P_a > P_c$ (therefore ΔP_o and ΔP_p are both positive), or (b) $P_a < P_c$ (therefore ΔP_o and ΔP_p are both negative). As explained by this application, maintaining the above relation increases the long-term reliability of the fuel cell, as otherwise, as seen in conventional fuel cell systems, "if the relation between the amount of pressure loss in the anode and the cathode during operation and that during purging is reversed, the solid polymer membrane vibrates from the anode side to the cathode side, so that the strength of the solid polymer membrane is significantly impaired" (paragraph [0019] of U.S. Patent App. Pub. No. 2007/0292728, the USPTO publication of this application).

Meltser does not disclose or suggest avoiding the reversal seen in conventional fuel cell systems. Instead, Meltser, paragraph [0006] simply discloses that during the particular purging/burping operation discussed therein,

significant pressure differential between the anode and cathode sides can occur. If the pressure differential is of a sufficient magnitude, the membrane separating the anode and cathode sides of the fuel cell stack can be damaged. Additionally, repeated exposure to a pressure differential of a sufficient magnitude can also cause fatigue in the membrane which can lead to premature failure of the fuel cell stack.

(emphasis added)

To address this, Meltser, paragraph [0010] discloses “maintain[ing] a pressure differential between an anode side of the fuel cell stack and the storage device below a predetermined value” *(emphasis added)*. See also Meltser, paragraph [0021] (“the pressure in accumulator 44 is maintained at a sufficient level so that a pressure difference or differential between accumulator 44 and the anode side of fuel cell stack 22 is below a predetermined level”; “Preferably, the pressure differential is maintained substantially constant”).

Thus, Meltser discloses or suggests, at most, a general practice of “maintain[ing] a pressure differential . . . below a predetermined value,” but does not suggest maintaining the “relation $0 < \Delta P_o \times \Delta P_p$ ” recited in the claims.

D. Simpson does not relate to the recited “purge operation”

Much as discussed above with respect to Meltser, although Simpson describes a “purge operation,” it does not correspond to the “purge operation of replacing the fuel gas and/or oxidant gas in said fuel cell with the inert gas . . . when said fuel cell is started up or shut down,” as recited in the claims, as the purge operation disclosed by Simpson neither (a) uses an inert gas, nor (b) is performed “when said fuel cell is started up or shut down.” Instead, as described in paragraphs [0024]-[0025] and [0045], Simpson describes purging on the exhaust side of the fuel

cell. Thus, at least because Simpson does not relate to the recited “purge operation,” contrary to the assertion made by the Examiner at page 4, line 8, Simpson does not disclose means for variably controlling a flow rate of a purge gas that corresponds to the claimed subject matter.

E. “the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied”

Independent claims 5 and 6 each recite, *inter alia*, “a controller configured . . . such that the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied.” As explained in this application, and not recognized by the cited art, by preventing reversal of the sign of ΔP , the solid polymer membrane is not vibrated between the anode and cathode sides, and long term reliability is improved. Use of a controller that ensures “the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied,” as recited in claims 5 and 6, is not rendered obvious by the cited art.

Imamura does not disclose or suggest that “the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied.” First, although Imamura, paragraphs [0055]-[0057], with respect to a first embodiment, discloses that $\Delta P_o = P_h - P_a > \text{positive value } P_1$, Imamura does not disclose that this relationship is always satisfied for at least ΔP_o . Second, throughout Imamura, “the outlet portion hydrogen pressure P_h is decreased to be lower than the inlet portion air pressure P_a ” (paragraph [0083]), such that ΔP_o is negative, as well as positive. *See also* paragraph [0098] and claims 2-3. Thus, Imamura expressly teaches reversal of the value of ΔP_o during normal operation. Third, the only discussion in Imamura of purging is that the disclosed technique allows operation “without purging the fuel electrode or the fuel passage” (paragraphs [0012], [0023], [0025], and [0058]). Accordingly, there is no suggestion as to how, if at all, the pressures P_a and P_h would be controlled during a purge operation. Finally, the Examiner relies on a statement in paragraph [0058] that since the relationship $P_h - P_a > P_1$ described in paragraphs [0055]-[0057] “limits the water diffusion from the air electrode side through the

electrolyte membrane to the fuel electrode side, it is possible to prevent the water residence around the electrode portions of the fuel electrode.” However, this is not relevant to a “purge operation” as recited in the claims, or the value of ΔP_p during such an operation.

Although Saito describes filling an anode circulation line with nitrogen to prevent anode oxidation at a time of starting, there is no suggestion of controlling differential pressures during operation and a purge operation such that “a controller configured . . . such that the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied.”

As explained above, the purge operation described in Simpson does not relate to the claimed “purge operation.” Additionally, Simpson does not suggest that “the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied.”

Accordingly, although Saito describes filling an anode circulation line with nitrogen to prevent anode oxidation at a time starting, and one embodiment in Imamura describes $\Delta P_o = P_h - P_a > \text{positive value } P_1$, this does not suggest the recited “controller configured . . . such that the relation $0 < \Delta P_o \times \Delta P_p$ is always satisfied.” Simpson and Meltser, individually or in combination, do not bridge the gaps between the claims and Saito and Imamura. Thus, the cited art does not render the above limitation obvious.

F. “the relation $|\Delta P_p| \leq |\Delta P_o|$ is satisfied”

As noted above, the present Office Action ignores this limitation. Looking to earlier discussions of such limitations, page 5 of the Office Action dated July 3, 2008 asserts

. . . it would have been obvious to one of ordinary skill in the art at the time of the invention to maintain the differential pressure during purging (ΔP_p) at or lower than the differential pressure during normal operation in order to prevent water residence around the electrode portions of the fuel electrode (Imamura, et al, paragraph [0058]) and prevent and/or minimize possibility of membrane separation (Meltser et al, paragraph [0021]).

However, nowhere does the cited art discuss or suggest any relationship between a differential pressure during normal operation versus a differential pressure during a “purge operation of replacing the fuel gas and/or oxidant gas in said fuel cell with the inert gas . . . when said fuel cell is started up or shut down.”

As one rationale for obviousness, the Examiner relies on Imamura, paragraph [0058], which discloses that where “the outlet portion hydrogen pressure P_h is controlled to always become a pressure higher by the set value P_1 or more than the inlet portion air pressure P_a ” (paragraph [0057]), it “limits the water diffusion from the air electrode side through the electrolyte membrane to the fuel electrode side, it is possible to prevent the water residence around the electrode portions of the fuel electrode without purging the fuel electrode or the fuel passage 30” (*portion noted by the Examiner emphasized*). However, Imamura’s disclosure relating to “prevent[ing] the water residence around the electrode portions of the fuel electrode” is only relevant to when the fuel cell is reacting hydrogen and oxygen (thereby producing water), and does not relate to the recited “a purge operation of replacing the fuel gas and/or oxidant gas in said fuel cell with the inert gas . . . when said fuel cell is started up or shut down” (wherein the inert gas does not react to produce water). Thus, Imamura does not provide a rationale by which “the relation $|\Delta P_p| \leq |\Delta P_o|$ ” would have been obvious.

As another rationale for obviousness, the Examiner relies upon Meltser, paragraph [0021], which discloses

. . . the pressure in accumulator 44 is maintained at a sufficient level so that a pressure difference or differential between accumulator 44 and the anode side of fuel cell stack 22 is below a predetermined level. By maintaining the pressure differential between the accumulator 44 and anode side of fuel cell stack 22 below a sufficient level, the pressure differential between the anode and cathode sides of the fuel cell stack 22 when the purging operation occurs can be controlled thus preventing and/or minimizing the possibility of the membrane separating the

anode and cathode sides from rupturing and/or premature failure due to fatigue stresses.

(portion noted by the Examiner emphasized)

However, as seen in the above excerpt, Meltser discloses that “maintaining the pressure differential . . . below a sufficient level” accomplishes “preventing and/or minimizing the possibility of the membrane separating.” Meltser does not disclose or suggest any particular relationship between a differential pressure during operation and a differential pressure during the recited “purge operation,” let alone the recited “relation $|\Delta P_p| \leq |\Delta P_o|$.” Thus, Meltser does not provide a rationale by which “the relation $|\Delta P_p| \leq |\Delta P_o|$ ” would have been obvious.

For at least the above reasons, the Examiner has not advanced a valid rationale⁶ to explain why one of ordinary skill in the art would have modified the teachings of Saito, Imamura, and Simpson to yield the claimed subject matter.

G. the last two paragraphs of claims 5 and 6

The last two paragraphs of each of claims 5 and 6 recite additional limitations for the controller element. These have not been addressed by the Examiner, and are presumptively nonobvious over the cited art, absent a *prima facie* case of obviousness set forth by the Examiner.

H. mere capability for a structure to be modified does not render the actual modification obvious

Based on the recent telephone interview and the basis of rejection set forth in the Office Action, it appears that the Examiner believes that merely because a structure is capable of modification to satisfy functional language recited in an apparatus claim, the structure should render such language obvious. However, as illustrated by the *Mills* case discussed above, mere

capability of modification does not demonstrate obviousness under Section 103. Instead, the Examiner must explain why, based on the state of the art as evidenced by the prior art, it would have been obvious for one of ordinary skill in the art to have actually modified the prior art in such a manner. No such explanation has been made by the Examiner.

I. Conclusion

For at least the above reasons, the Examiner has not demonstrated that independent claims 5 and 6 are rendered obvious by the cited art. Thus, Applicants respectfully request withdrawal of the rejection under Section 103.

IV. Conclusion

Accordingly, it is urged that the application, as now amended, is in condition for allowance, an indication of which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, Examiner is requested to call Applicants' attorney at the telephone number shown below.

⁶ As explained in MPEP 2142, ““there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). *See also KSR*, 550 U.S. at ___, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval).”

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP



Eric M. Shelton

Registration No. 57,630

600 13th Street, N.W.
Washington, DC 20005-3096
Phone: 202.756.8000 EMS:amz
Facsimile: 202.756.8087
Date: September 16, 2009

**Please recognize our Customer No. 53080
as our correspondence address.**